HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P. O. Box 272400
Fort Collins, Colorado 80527-2400

PATENT APPLICATION

ATTORNEY DOCKET NO. 10006301-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Niranjan Damera-Venkata	**Confirmation No.:**	9595
Application No.:	09/935,457	**Examiner:**	Alavi, Amir
Filing Date:	08/23/2001	**Group Art Unit:**	2621
Title:	SYSTEM AND METHOD FOR EMBEDDING INFORMATION WITHIN A PRINTED IMAGE USING BLOCK ERROR DIFFUSION HALFTONING		

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on **6/21/2005**.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

( ) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

( )	one month	$120.00
( )	two months	$450.00
( )	three months	$1020.00
( )	four months	$1590.00

( ) The extension fee has already been filled in this application.

(X) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account **08-2025** the sum of **$500.00**. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees. A duplicate copy of this sheet is enclosed.

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Number of pages: **38**

Typed Name: **Thomas H. Ham**

Signature: Thomas H. Ham

Rev 12/04 (Apbrief)

Respectfully submitted,

Niranjan Damera-Venkata

By Thomas H. Ham

Thomas H. Ham

Attorney/Agent for Applicant(s)
Reg. No. **43,654**

Date: **08/19/2005**

Telephone No.: **(925) 249-1300**

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Respectfully submitted,

Niranjan Damera-Venkata

By Thomas H. Ham

Thomas H. Ham

Attorney/Agent for Applicant(s)
Reg. No. 43,664

Date: 08/19/2005

Telephone No.: (925) 249-1300

Rev 12/04 (ApBrief)

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For: SYSTEM AND METHOD FOR EMBEDDING INFORMATION WITHIN A PRINTED IMAGE USING BLOCK ERROR DIFFUSION HALFTONING

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BRIEF ON APPEAL

Sir/Madam:

This brief is in furtherance of Applicant's Notice of Appeal filed on June 21, 2005, appealing the decision of the Examiner dated April 21, 2005 finally rejecting claims 1-21. A copy of the claims appears in the Appendix to this brief. This brief is transmitted in triplicate.

I. Real Party in Interest

The real party in interest in this appeal is Hewlett-Packard Company, a Delaware Corporation, having a principal place or place of business in Palo Alto, California.

II. Related Appeals and Interferences

There are currently no related appeals or interference proceedings in progress that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the present Appeal.

III. Status of Claims

Claims 1-21 were originally filed with the application on August 23, 2001. In the Amendment and Response to Office Action filed on December 14, 2004, claims 1, 9 and 17 were amended. No claims have been amended, canceled, or added for purposes of this Appeal.

Claims 1, 5-6, 8, 9, 13, 14, 16, 17 and 21 stand rejected under 35 U.S.C. 102(c) as allegedly being anticipated by Brunk (U.S. Patent No. 6,694,041 B1). Furthermore, claims 2-4, 7, 10-12, 15 and 18-20 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Brunk in view of Chang (U.S. Patent No. 6,256,398 B1).

This Appeal is made with regard to pending claims 1-21.

IV. Status of Amendments

No amendments were filed subsequent to final rejection.

V. Summary of the Invention

The claimed invention is a system and method for embedding information within an input image using specific type pixel blocks of the input image to selectively embed the information into the input image (see Applicant's specification from page 2, line 32, to page 3, line 1). According to the invention, as recited in claim 1, a method of embedding information in images comprises detecting (408) first type pixel blocks of an input image and modulating (412) the first type pixel blocks of the input image based on the information to produce an output image. Each of the first type pixel blocks includes a plurality of pixels. The first type pixel blocks are dependent on pixel values within the first type pixel blocks. The output image includes the input image and the information. As recited in claim 5, the method may further comprise a step of diffusing (414) halftone errors of each pixel block of the input image into neighboring pixel blocks of the input image on a pixel block by pixel block basis. As recited in claim 6, the step of modulating the first type pixel blocks may include replacing the first type pixel blocks of the input image with dot shape blocks such that the information is represented by the dot shape blocks. According to the invention, as recited in claim 9, a system for embedding information in images comprises a pixel block type detector (116) and a block modulator (120). The pixel block type detector is configured to detect first type pixel blocks of an input image. Each of the first type pixel blocks includes a plurality of pixels. The first type pixel blocks are dependent on pixel values within the first type pixel blocks. The block modulator is configured to modulate the first type pixel blocks of the input image based on the information to be embedded to produce an output image. The output image includes the input image and the information. As recited in claim 13, the system may further comprise an error diffusion halftoner (122) coupled to the block modulator. The error diffusion halftoner is configured to diffuse halftone errors of each pixel block of the input image into neighboring pixel blocks of the input image on a pixel block by pixel block basis. As recited in claim 14, the block modulator may be configured to replace the first type pixel blocks of the input image with dot shape blocks such that the information is represented by the dot shape blocks.

VI. Issues

Whether claims 1, 5, 6, 9, 13, 14, 17 and 21 are anticipated under 35 U.S.C. 102(e) by Brunk.

VII. Grouping of Claims for Each Contested Ground of Rejection

For purposes of this Appeal, claims 1 and 9 stand or fall together, claims 5, 13 and 17 stand or fall together, and claims 6, 14 and 21 stand or fall together. The reason why the above-identified claims are grouped together is explained in the following Argument section.

VIII. Argument

A. Rejection of Claims 1 and 9 Under 35 U.S.C. §102(e)

The independent claims 1 and 9 were rejected under 35 U.S.C. §102(e) in the Final Office Action of April 21, 2005 as allegedly being anticipated by Brunk. The independent claim 1 recites a method of embedding information in images comprising:

> *"detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and*
> *modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information."*

As explained below, the recited "*detecting*" and "*modulating*" elements of the independent claim 1 are not disclosed in Brunk. Thus, the independent claim 1 is not anticipated by Brunk.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); MPEP §2131. As correctly stated in the Final Office Action, Brunk does disclose "a modified error diffusion method that embeds a watermark comprising a set

of binary values at specified dot locations in a binary image." Furthermore, the method of Brunk does assign "to these locations the corresponding values of the watermark". However, the specified dot locations used by the Brunk method are pixel locations, as described in column 4, lines 1-14. Thus, the Brunk method operates at the pixel level, not at the level of pixel blocks, as is the case in the method of the independent claim 1. Consequently, Brunk does not disclose the limitation of "*detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks*," as recited in the independent claim 1. Similarly, Brunk does not disclose the limitation of "*modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information*," as further recited in the independent claim 1. Since each recited limitation of the independent claim 1 is not disclosed in the cited reference of Brunk, the independent claim 1 is not anticipated by Brunk.

In response to Applicant's previous argument, the Office Action states that "Examiner considers the cited prior art, namely, Brunk-USPN-6,694,041 B1, column 3, lines 56-65, to clearly address pixel blocks, as such, wherein a set of binary values, being indeed more than one and being a set constitutes blocks." However, the "set of binary values" in Brunk refers to a watermark, which is embedded at specified dot locations in a binary image, as stated in column 3, lines 57-58. Thus, the "set of binary values" has nothing to do with the limitation of "*detecting first type pixel blocks of an input image*" or the limitation of "*modulating said first type pixel blocks of said input image based on said information to produce an output image*," as recited in the independent claim 1.

The independent claim 9 recites similar limitations as the independent claim 1. The independent claim 9 recites a system for embedding information in images comprising:

> "*a pixel block type detector that is configured to detect first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and*

a block modulator that is configured to modulate said first type pixel blocks of said input image based on said information to be embedded to produce an output image, said output image including said input image and said information."

Thus, the above remarks are also applicable to the independent claims 9. As such, the independent claim 9 is also not anticipated by Brunk.

B. Rejection of Claims 5, 13 and 17 Under 35 U.S.C. §102(e)

Similar to the independent claims 1 and 9, the independent claim 17 was rejected under 35 U.S.C. §102(e) in the Final Office Action as allegedly being anticipated by Brunk. The independent claim 17 recites the "*detecting*" and "*modulating*" limitations of the independent claim 1. Thus, the independent claim 17 is also not anticipated by Brunk, as explained above with respect to the independent claim 1.

In addition to the "*detecting*" and "*modulating*" limitations, the independent claim 17 further recites the limitation of "*converting pixels of said input image into halftones, including diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis.*" As correctly stated in the Final Office Action, Brunk does disclose "a modified error diffusion method that embeds a watermark comprising a set of binary values at specified dot locations in a binary image." However, the modified error diffusion method of Brunk is performed on pixels using a new set of error diffusion weights, as illustrated in Fig. 3 and described in column 4, lines 13-24. The "X" in Fig. 3 of Brunk represents the pixel location currently being processed, as explained in column 3, lines 21 and 22. Thus, Brunk does not disclose "*diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis*" (emphasis added), as recited in the independent claim 17. Consequently, the independent claim 17 is not anticipated by Brunk.

The dependent claims 5 and 13 recite similar limitations as the independent claim 17. The dependent claim 5 recites "*a step of diffusing halftone errors of each*

pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis." The dependent claim 13 recites *"an error diffusion halftoner coupled to said block modulator, said error diffusion halftoner being configured to diffuse halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis."* Thus, the above remarks are also applicable to the dependent claims 5 and 13. Consequently, the dependent claims 5 and 13 are also not anticipated by Brunk.

C. Rejection of Claims 6, 14 and 21 Under 35 U.S.C. §102(e)

The dependent claims 6, 14 and 21 were also rejected under 35 U.S.C. §102(e) in the Final Office Action as allegedly being anticipated by Brunk. The dependent claim 6 recites *"wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* The cited reference of Brunk does not disclose such a limitation, and thus, the dependent claim 6 is not anticipated by Brunk.

As correctly stated in the Office Action, the method of Brunk "assigns to dot locations the corresponding values of the watermark." However, as explained above with respect to the independent claim 1, the method of Brunk operates at the pixel level, not at the pixel block level. Thus, Brunk does not disclose *"replacing said first type pixel blocks of said input image with dot shape blocks,"* as recited in the dependent claim 6. Consequently, the dependent claim 6 is not anticipated by Brunk.

The dependent claims 14 and 21 recite similar limitations as the dependent claim 6. The dependent claim 14 recites *"wherein said block modulator is configured to replace said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* The dependent claim 21 recites *"wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* Thus, the above remarks are also applicable to the dependent claims 14 and 21. Consequently, the dependent claims 14 and 21 are also not anticipated by Brunk.

SUMMARY

The independent claim 1 is not anticipated by Brunk because the method of Brunk operates at the pixel level, not at the pixel block level. Thus, Brunk does not disclose the limitation of "*detecting first type pixel blocks of an input image*" and the limitation of "*modulating said first type pixel blocks of said input image based on said information to produce an output image,*" as recited in the independent claim. Since the independent claim 9 recites similar limitations as the independent claim 1, the independent claim 9 is also not anticipated by Brunk. In addition, the independent claim 17 is not anticipated by Brunk because Brunk discloses an error diffusion method that operates on pixels, not on pixel blocks. Thus, Brunk does not disclose the limitation of "*diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis,*" as recited in the independent claim 17. Since the dependent claims 5 and 13 recite similar limitations as the independent claim 17, the dependent claim 5 and 13 are also not anticipated by Brunk. Because the method of Brunk operates at the pixel level, not at the pixel block level, Brunk also does not disclose the limitation of "*wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks,*" as recited in the dependent claim 6. Since the dependent claims 14 and 21 recite similar limitations as the dependent claim 6, the dependent claim 14 and 21 are also not anticipated by Brunk.

For all the foregoing reasons, it is earnestly and respectfully requested that the Board of Patent Appeals and Interferences reverse the rejections of the Examiner regarding claims 1-21, so that this case may be allowed and pass to issue in a timely manner.

Respectfully submitted,
Niranjan Damera-Venkata

Date: August 19, 2005

By: Thomas H. Ham
Thomas H. Ham
Registration No. 43,654
Telephone: (925) 249-1300

Appendix

1. A method of embedding information in images comprising:

detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and

modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information.

2. The method of claim 1 wherein said step of detecting said first type pixel blocks of said input image includes detecting minority pixel blocks of said input image, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

3. The method of claim 2 wherein said minority pixel blocks include a majority of dark pixels.

4. The method of claim 2 wherein said minority pixel blocks includes a majority of light pixels.

5. The method of claim 1 further comprising a step of diffusing halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis.

6. The method of claim 1 wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.

7. The method of claim 6 wherein some of said dot shape blocks represents synchronization data.

8. The method of claim 6 wherein some of said dot shape blocks represents binary data.

9. A system for embedding information in images comprising:

a pixel block type detector that is configured to detect first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and

a block modulator that is configured to modulate said first type pixel blocks of said input image based on said information to be embedded to produce an output image, said output image including said input image and said information.

10. The system of claim 9 wherein said pixel block type detector is configured to detect minority pixel blocks of said input image, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

11. The system of claim 10 wherein said minority pixel blocks include a majority of dark pixels.

12. The system of claim 10 wherein said minority pixel blocks includes a majority of light pixels.

13. The system of claim 9 further comprising an error diffusion halftoner coupled to said block modulator, said error diffusion halftoner being configured to diffuse halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis.

14. The system of claim 9 wherein said block modulator is configured to replace said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.

15. The system of claim 14 wherein some of said dot shape blocks represents synchronization data.

16. The system of claim 14 wherein some of said dot shape blocks represents binary data.

17. A method of embedded information in images comprising:

detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks;

modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information; and

converting pixels of said input image into halftones, including diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis.

18. The method of claim 17 wherein said first type pixel blocks of said input image include minority pixel blocks, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

19. The method of claim 18 wherein said minority pixel blocks include a majority of dark pixels.

20. The method of claim 18 wherein said minority pixel blocks includes a majority of light pixels.

21. The method of claim 17 wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.

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CERTIFICATE OF TRANSMISSION UNDER 37 C.F.R. 1.8
I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being facsimile transmitted to the Patent and Trademark Office facsimile number (571) 373-8300 on August 19, 2005.
Number of Pages: 38 (including TRANSMITTAL LETTER)

Signed: Thomas H. Ham
Typed Name: Thomas H. Ham

I. Real Party in Interest

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Claims 1, 5-6, 8, 9, 13, 14, 16, 17 and 21 stand rejected under 35 U.S.C. 102(e) as allegedly being anticipated by Brunk (U.S. Patent No. 6,694,041 B1). Furthermore, claims 2-4, 7, 10-12, 15 and 18-20 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Brunk in view of Chang (U.S. Patent No. 6,256,398 B1).

This Appeal is made with regard to pending claims 1-21.

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V. Summary of the Invention

The claimed invention is a system and method for embedding information within an input image using specific type pixel blocks of the input image to selectively embed the information into the input image (see Applicant's specification from page 2, line 32, to page 3, line 1). According to the invention, as recited in claim 1, a method of embedding information in images comprises detecting (408) first type pixel blocks of an input image and modulating (412) the first type pixel blocks of the input image based on the information to produce an output image. Each of the first type pixel blocks includes a plurality of pixels. The first type pixel blocks are dependent on pixel values within the first type pixel blocks. The output image includes the input image and the information. As recited in claim 5, the method may further comprise a step of diffusing (414) halftone errors of each pixel block of the input image into neighboring pixel blocks of the input image on a pixel block by pixel block basis. As recited in claim 6, the step of modulating the first type pixel blocks may include replacing the first type pixel blocks of the input image with dot shape blocks such that the information is represented by the dot shape blocks. According to the invention, as recited in claim 9, a system for embedding information in images comprises a pixel block type detector (116) and a block modulator (120). The pixel block type detector is configured to detect first type pixel blocks of an input image. Each of the first type pixel blocks includes a plurality of pixels. The first type pixel blocks are dependent on pixel values within the first type pixel blocks. The block modulator is configured to modulate the first type pixel blocks of the input image based on the information to be embedded to produce an output image. The output image includes the input image and the information. As recited in claim 13, the system may further comprise an error diffusion halftoner (122) coupled to the block modulator. The error diffusion halftoner is configured to diffuse halftone errors of each pixel block of the input image into neighboring pixel blocks of the input image on a pixel block by pixel block basis. As recited in claim 14, the block modulator may be configured to replace the first type pixel blocks of the input image with dot shape blocks such that the information is represented by the dot shape blocks.

VI. Issues

Whether claims 1, 5, 6, 9, 13, 14, 17 and 21 are anticipated under 35 U.S.C. 102(e) by Brunk.

VII. Grouping of Claims for Each Contested Ground of Rejection

For purposes of this Appeal, claims 1 and 9 stand or fall together, claims 5, 13 and 17 stand or fall together, and claims 6, 14 and 21 stand or fall together. The reason why the above-identified claims are grouped together is explained in the following Argument section.

VIII. Argument

A. Rejection of Claims 1 and 9 Under 35 U.S.C. §102(e)

The independent claims 1 and 9 were rejected under 35 U.S.C. §102(e) in the Final Office Action of April 21, 2005 as allegedly being anticipated by Brunk. The independent claim 1 recites a method of embedding information in images comprising:

> *"detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and*
> *modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information."*

As explained below, the recited "*detecting*" and "*modulating*" elements of the independent claim 1 are not disclosed in Brunk. Thus, the independent claim 1 is not anticipated by Brunk.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); MPEP §2131. As correctly stated in the Final Office Action, Brunk does disclose "a modified error diffusion method that embeds a watermark comprising a set

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In response to Applicant's previous argument, the Office Action states that "Examiner considers the cited prior art, namely, Brunk-USPN-6,694,041 B1, column 3, lines 56-65, to clearly address pixel blocks, as such, wherein a set of binary values, being indeed more than one and being a set constitutes blocks." However, the "set of binary values" in Brunk refers to a watermark, which is embedded at specified dot locations in a binary image, as stated in column 3, lines 57-58. Thus, the "set of binary values" has nothing to do with the limitation of "*detecting first type pixel blocks of an input image*" or the limitation of "*modulating said first type pixel blocks of said input image based on said information to produce an output image,*" as recited in the independent claim 1.

The independent claim 9 recites similar limitations as the independent claim 1. The independent claim 9 recites a system for embedding information in images comprising:

> *"a pixel block type detector that is configured to detect first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and*

a block modulator that is configured to modulate said first type pixel blocks of said input image based on said information to be embedded to produce an output image, said output image including said input image and said information."

Thus, the above remarks are also applicable to the independent claims 9. As such, the independent claim 9 is also not anticipated by Brunk.

B. Rejection of Claims 5, 13 and 17 Under 35 U.S.C. §102(e)

Similar to the independent claims 1 and 9, the independent claim 17 was rejected under 35 U.S.C. §102(e) in the Final Office Action as allegedly being anticipated by Brunk. The independent claim 17 recites the "*detecting*" and "*modulating*" limitations of the independent claim 1. Thus, the independent claim 17 is also not anticipated by Brunk, as explained above with respect to the independent claim 1.

In addition to the "*detecting*" and "*modulating*" limitations, the independent claim 17 further recites the limitation of "*converting pixels of said input image into halftones, including diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis*." As correctly stated in the Final Office Action, Brunk does disclose "a modified error diffusion method that embeds a watermark comprising a set of binary values at specified dot locations in a binary image." However, the modified error diffusion method of Brunk is performed on pixels using a new set of error diffusion weights, as illustrated in Fig. 3 and described in column 4, lines 13-24. The "X" in Fig. 3 of Brunk represents the pixel location currently being processed, as explained in column 3, lines 21 and 22. Thus, Brunk does not disclose "*diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis*" (emphasis added), as recited in the independent claim 17. Consequently, the independent claim 17 is not anticipated by Brunk.

The dependent claims 5 and 13 recite similar limitations as the independent claim 17. The dependent claim 5 recites "*a step of diffusing halftone errors of each*

pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis." The dependent claim 13 recites *"an error diffusion halftoner coupled to said block modulator, said error diffusion halftoner being configured to diffuse halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis."* Thus, the above remarks are also applicable to the dependent claims 5 and 13. Consequently, the dependent claims 5 and 13 are also not anticipated by Brunk.

C. Rejection of Claims 6, 14 and 21 Under 35 U.S.C. §102(e)

The dependent claims 6, 14 and 21 were also rejected under 35 U.S.C. §102(e) in the Final Office Action as allegedly being anticipated by Brunk. The dependent claim 6 recites *"wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* The cited reference of Brunk does not disclose such a limitation, and thus, the dependent claim 6 is not anticipated by Brunk.

As correctly stated in the Office Action, the method of Brunk "assigns to dot locations the corresponding values of the watermark." However, as explained above with respect to the independent claim 1, the method of Brunk operates at the pixel level, not at the pixel block level. Thus, Brunk does not disclose *"replacing said first type pixel blocks of said input image with dot shape blocks,"* as recited in the dependent claim 6. Consequently, the dependent claim 6 is not anticipated by Brunk.

The dependent claims 14 and 21 recite similar limitations as the dependent claim 6. The dependent claim 14 recites *"wherein said block modulator is configured to replace said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* The dependent claim 21 recites *"wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* Thus, the above remarks are also applicable to the dependent claims 14 and 21. Consequently, the dependent claims 14 and 21 are also not anticipated by Brunk.

SUMMARY

The independent claim 1 is not anticipated by Brunk because the method of Brunk operates at the pixel level, not at the pixel block level. Thus, Brunk does not disclose the limitation of "*detecting first type pixel blocks of an input image*" and the limitation of "*modulating said first type pixel blocks of said input image based on said information to produce an output image,*" as recited in the independent claim. Since the independent claim 9 recites similar limitations as the independent claim 1, the independent claim 9 is also not anticipated by Brunk. In addition, the independent claim 17 is not anticipated by Brunk because Brunk discloses an error diffusion method that operates on pixels, not on pixel blocks. Thus, Brunk does not disclose the limitation of "*diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis,*" as recited in the independent claim 17. Since the dependent claims 5 and 13 recite similar limitations as the independent claim 17, the dependent claim 5 and 13 are also not anticipated by Brunk. Because the method of Brunk operates at the pixel level, not at the pixel block level, Brunk also does not disclose the limitation of "*wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks,*" as recited in the dependent claim 6. Since the dependent claims 14 and 21 recite similar limitations as the dependent claim 6, the dependent claim 14 and 21 are also not anticipated by Brunk.

For all the foregoing reasons, it is earnestly and respectfully requested that the Board of Patent Appeals and Interferences reverse the rejections of the Examiner regarding claims 1-21, so that this case may be allowed and pass to issue in a timely manner.

Respectfully submitted,
Niranjan Damera-Venkata

Date: August 19, 2005

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Appendix

1. A method of embedding information in images comprising:

detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and

modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information.

2. The method of claim 1 wherein said step of detecting said first type pixel blocks of said input image includes detecting minority pixel blocks of said input image, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

3. The method of claim 2 wherein said minority pixel blocks include a majority of dark pixels.

4. The method of claim 2 wherein said minority pixel blocks includes a majority of light pixels.

5. The method of claim 1 further comprising a step of diffusing halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis.

6. The method of claim 1 wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.

7. The method of claim 6 wherein some of said dot shape blocks represents synchronization data.

8. The method of claim 6 wherein some of said dot shape blocks represents binary data.

9. A system for embedding information in images comprising:

a pixel block type detector that is configured to detect first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and

a block modulator that is configured to modulate said first type pixel blocks of said input image based on said information to be embedded to produce an output image, said output image including said input image and said information.

10. The system of claim 9 wherein said pixel block type detector is configured to detect minority pixel blocks of said input image, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

11. The system of claim 10 wherein said minority pixel blocks include a majority of dark pixels.

12. The system of claim 10 wherein said minority pixel blocks includes a majority of light pixels.

13. The system of claim 9 further comprising an error diffusion halftoner coupled to said block modulator, said error diffusion halftoner being configured to diffuse halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis.

14. The system of claim 9 wherein said block modulator is configured to replace said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.

15. The system of claim 14 wherein some of said dot shape blocks represents synchronization data.

16. The system of claim 14 wherein some of said dot shape blocks represents binary data.

17. A method of embedded information in images comprising:

detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks;

modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information; and

converting pixels of said input image into halftones, including diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis.

18. The method of claim 17 wherein said first type pixel blocks of said input image include minority pixel blocks, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

19. The method of claim 18 wherein said minority pixel blocks include a majority of dark pixels.

20. The method of claim 18 wherein said minority pixel blocks includes a majority of light pixels.

21. The method of claim 17 wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.

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Attorney Docket No. 10006301-1 PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Niranjan Damera-Venkata
Serial No. 09/935,457
Filed: August 23, 2001
Group Art Unit: 2621
Confirmation No. 9595
Examiner: Alavi, Amir

For: SYSTEM AND METHOD FOR EMBEDDING INFORMATION WITHIN A PRINTED IMAGE USING BLOCK ERROR DIFFUSION HALFTONING

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

BRIEF ON APPEAL

Sir/Madam:

This brief is in furtherance of Applicant's Notice of Appeal filed on June 21, 2005, appealing the decision of the Examiner dated April 21, 2005 finally rejecting claims 1-21. A copy of the claims appears in the Appendix to this brief. This brief is transmitted in triplicate.

CERTIFICATE OF TRANSMISSION UNDER 37 C.F.R. 1.8
I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being facsimile transmitted to the Patent and Trademark Office facsimile number (571) 373-8300 on August 19, 2005.
Number of Pages: 38 (including TRANSMITTAL LETTER)

Signed: Thomas H. Ham
Typed Name: Thomas H. Ham

I. Real Party in Interest

The real party in interest in this appeal is Hewlett-Packard Company, a Delaware Corporation, having a principal place or place of business in Palo Alto, California.

II. Related Appeals and Interferences

There are currently no related appeals or interference proceedings in progress that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the present Appeal.

III. Status of Claims

Claims 1-21 were originally filed with the application on August 23, 2001. In the Amendment and Response to Office Action filed on December 14, 2004, claims 1, 9 and 17 were amended. No claims have been amended, canceled, or added for purposes of this Appeal.

Claims 1, 5-6, 8, 9, 13, 14, 16, 17 and 21 stand rejected under 35 U.S.C. 102(e) as allegedly being anticipated by Brunk (U.S. Patent No. 6,694,041 B1). Furthermore, claims 2-4, 7, 10-12, 15 and 18-20 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Brunk in view of Chang (U.S. Patent No. 6,256,398 B1).

This Appeal is made with regard to pending claims 1-21.

IV. Status of Amendments

No amendments were filed subsequent to final rejection.

V. Summary of the Invention

The claimed invention is a system and method for embedding information within an input image using specific type pixel blocks of the input image to selectively embed the information into the input image (see Applicant's specification from page 2, line 32, to page 3, line 1). According to the invention, as recited in claim 1, a method of embedding information in images comprises detecting (408) first type pixel blocks of an input image and modulating (412) the first type pixel blocks of the input image based on the information to produce an output image. Each of the first type pixel blocks includes a plurality of pixels. The first type pixel blocks are dependent on pixel values within the first type pixel blocks. The output image includes the input image and the information. As recited in claim 5, the method may further comprise a step of diffusing (414) halftone errors of each pixel block of the input image into neighboring pixel blocks of the input image on a pixel block by pixel block basis. As recited in claim 6, the step of modulating the first type pixel blocks may include replacing the first type pixel blocks of the input image with dot shape blocks such that the information is represented by the dot shape blocks. According to the invention, as recited in claim 9, a system for embedding information in images comprises a pixel block type detector (116) and a block modulator (120). The pixel block type detector is configured to detect first type pixel blocks of an input image. Each of the first type pixel blocks includes a plurality of pixels. The first type pixel blocks are dependent on pixel values within the first type pixel blocks. The block modulator is configured to modulate the first type pixel blocks of the input image based on the information to be embedded to produce an output image. The output image includes the input image and the information. As recited in claim 13, the system may further comprise an error diffusion halftoner (122) coupled to the block modulator. The error diffusion halftoner is configured to diffuse halftone errors of each pixel block of the input image into neighboring pixel blocks of the input image on a pixel block by pixel block basis. As recited in claim 14, the block modulator may be configured to replace the first type pixel blocks of the input image with dot shape blocks such that the information is represented by the dot shape blocks.

VI. Issues

Whether claims 1, 5, 6, 9, 13, 14, 17 and 21 are anticipated under 35 U.S.C. 102(e) by Brunk.

VII. Grouping of Claims for Each Contested Ground of Rejection

For purposes of this Appeal, claims 1 and 9 stand or fall together, claims 5, 13 and 17 stand or fall together, and claims 6, 14 and 21 stand or fall together. The reason why the above-identified claims are grouped together is explained in the following Argument section.

VIII. Argument

A. Rejection of Claims 1 and 9 Under 35 U.S.C. §102(e)

The independent claims 1 and 9 were rejected under 35 U.S.C. §102(e) in the Final Office Action of April 21, 2005 as allegedly being anticipated by Brunk. The independent claim 1 recites a method of embedding information in images comprising:

> *"detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and*
> *modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information."*

As explained below, the recited "*detecting*" and "*modulating*" elements of the independent claim 1 are not disclosed in Brunk. Thus, the independent claim 1 is not anticipated by Brunk.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); MPEP §2131. As correctly stated in the Final Office Action, Brunk does disclose "a modified error diffusion method that embeds a watermark comprising a set

of binary values at specified dot locations in a binary image." Furthermore, the method of Brunk does assign "to these locations the corresponding values of the watermark". However, the specified dot locations used by the Brunk method are pixel locations, as described in column 4, lines 1-14. Thus, the Brunk method operates at the pixel level, not at the level of pixel blocks, as is the case in the method of the independent claim 1. Consequently, Brunk does not disclose the limitation of "*detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks*," as recited in the independent claim 1. Similarly, Brunk does not disclose the limitation of "*modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information*," as further recited in the independent claim 1. Since each recited limitation of the independent claim 1 is not disclosed in the cited reference of Brunk, the independent claim 1 is not anticipated by Brunk.

In response to Applicant's previous argument, the Office Action states that "Examiner considers the cited prior art, namely, Brunk-USPN-6,694,041 B1, column 3, lines 56-65, to clearly address pixel blocks, as such, wherein a set of binary values, being indeed more than one and being a set constitutes blocks." However, the "set of binary values" in Brunk refers to a watermark, which is embedded at specified dot locations in a binary image, as stated in column 3, lines 57-58. Thus, the "set of binary values" has nothing to do with the limitation of "*detecting first type pixel blocks of an input image*" or the limitation of "*modulating said first type pixel blocks of said input image based on said information to produce an output image*," as recited in the independent claim 1.

The independent claim 9 recites similar limitations as the independent claim 1. The independent claim 9 recites a system for embedding information in images comprising:

> "*a pixel block type detector that is configured to detect first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and*

a block modulator that is configured to modulate said first type pixel blocks of said input image based on said information to be embedded to produce an output image, said output image including said input image and said information."

Thus, the above remarks are also applicable to the independent claims 9. As such, the independent claim 9 is also not anticipated by Brunk.

B. Rejection of Claims 5, 13 and 17 Under 35 U.S.C. §102(e)

Similar to the independent claims 1 and 9, the independent claim 17 was rejected under 35 U.S.C. §102(e) in the Final Office Action as allegedly being anticipated by Brunk. The independent claim 17 recites the "*detecting*" and "*modulating*" limitations of the independent claim 1. Thus, the independent claim 17 is also not anticipated by Brunk, as explained above with respect to the independent claim 1.

In addition to the "*detecting*" and "*modulating*" limitations, the independent claim 17 further recites the limitation of "*converting pixels of said input image into halftones, including diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis.*" As correctly stated in the Final Office Action, Brunk does disclose "a modified error diffusion method that embeds a watermark comprising a set of binary values at specified dot locations in a binary image." However, the modified error diffusion method of Brunk is performed on pixels using a new set of error diffusion weights, as illustrated in Fig. 3 and described in column 4, lines 13-24. The "X" in Fig. 3 of Brunk represents the pixel location currently being processed, as explained in column 3, lines 21 and 22. Thus, Brunk does not disclose "*diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis*" (emphasis added), as recited in the independent claim 17. Consequently, the independent claim 17 is not anticipated by Brunk.

The dependent claims 5 and 13 recite similar limitations as the independent claim 17. The dependent claim 5 recites *"a step of diffusing halftone errors of each*

pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis." The dependent claim 13 recites *"an error diffusion halftoner coupled to said block modulator, said error diffusion halftoner being configured to diffuse halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis."* Thus, the above remarks are also applicable to the dependent claims 5 and 13. Consequently, the dependent claims 5 and 13 are also not anticipated by Brunk.

C. Rejection of Claims 6, 14 and 21 Under 35 U.S.C. §102(e)

The dependent claims 6, 14 and 21 were also rejected under 35 U.S.C. §102(e) in the Final Office Action as allegedly being anticipated by Brunk. The dependent claim 6 recites *"wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* The cited reference of Brunk does not disclose such a limitation, and thus, the dependent claim 6 is not anticipated by Brunk.

As correctly stated in the Office Action, the method of Brunk "assigns to dot locations the corresponding values of the watermark." However, as explained above with respect to the independent claim 1, the method of Brunk operates at the pixel level, not at the pixel block level. Thus, Brunk does not disclose *"replacing said first type pixel blocks of said input image with dot shape blocks,"* as recited in the dependent claim 6. Consequently, the dependent claim 6 is not anticipated by Brunk.

The dependent claims 14 and 21 recite similar limitations as the dependent claim 6. The dependent claim 14 recites *"wherein said block modulator is configured to replace said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* The dependent claim 21 recites *"wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks."* Thus, the above remarks are also applicable to the dependent claims 14 and 21. Consequently, the dependent claims 14 and 21 are also not anticipated by Brunk.

SUMMARY

The independent claim 1 is not anticipated by Brunk because the method of Brunk operates at the pixel level, not at the pixel block level. Thus, Brunk does not disclose the limitation of "*detecting first type pixel blocks of an input image*" and the limitation of "*modulating said first type pixel blocks of said input image based on said information to produce an output image*," as recited in the independent claim. Since the independent claim 9 recites similar limitations as the independent claim 1, the independent claim 9 is also not anticipated by Brunk. In addition, the independent claim 17 is not anticipated by Brunk because Brunk discloses an error diffusion method that operates on pixels, not on pixel blocks. Thus, Brunk does not disclose the limitation of "*diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis,*" as recited in the independent claim 17. Since the dependent claims 5 and 13 recite similar limitations as the independent claim 17, the dependent claim 5 and 13 are also not anticipated by Brunk. Because the method of Brunk operates at the pixel level, not at the pixel block level, Brunk also does not disclose the limitation of "*wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks,*" as recited in the dependent claim 6. Since the dependent claims 14 and 21 recite similar limitations as the dependent claim 6, the dependent claim 14 and 21 are also not anticipated by Brunk.

For all the foregoing reasons, it is earnestly and respectfully requested that the Board of Patent Appeals and Interferences reverse the rejections of the Examiner regarding claims 1-21, so that this case may be allowed and pass to issue in a timely manner.

Respectfully submitted,
Niranjan Damera-Venkata

Date: August 19, 2005

By: Thomas H. Ham
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Appendix

1. A method of embedding information in images comprising:

detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and

modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information.

2. The method of claim 1 wherein said step of detecting said first type pixel blocks of said input image includes detecting minority pixel blocks of said input image, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

3. The method of claim 2 wherein said minority pixel blocks include a majority of dark pixels.

4. The method of claim 2 wherein said minority pixel blocks includes a majority of light pixels.

5. The method of claim 1 further comprising a step of diffusing halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis.

6. The method of claim 1 wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.

7. The method of claim 6 wherein some of said dot shape blocks represents synchronization data.

8. The method of claim 6 wherein some of said dot shape blocks represents binary data.

9. A system for embedding information in images comprising:

a pixel block type detector that is configured to detect first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks; and

a block modulator that is configured to modulate said first type pixel blocks of said input image based on said information to be embedded to produce an output image, said output image including said input image and said information.

10. The system of claim 9 wherein said pixel block type detector is configured to detect minority pixel blocks of said input image, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

11. The system of claim 10 wherein said minority pixel blocks include a majority of dark pixels.

12. The system of claim 10 wherein said minority pixel blocks includes a majority of light pixels.

13. The system of claim 9 further comprising an error diffusion halftoner coupled to said block modulator, said error diffusion halftoner being configured to diffuse halftone errors of each pixel block of said input image into neighboring pixel blocks of said input image on a pixel block by pixel block basis.

14. The system of claim 9 wherein said block modulator is configured to replace said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.

15. The system of claim 14 wherein some of said dot shape blocks represents synchronization data.

16. The system of claim 14 wherein some of said dot shape blocks represents binary data.

17. A method of embedded information in images comprising:

detecting first type pixel blocks of an input image, each of said first type pixel blocks including a plurality of pixels, said first type pixel blocks being dependent on pixel values within said first type pixel blocks;

modulating said first type pixel blocks of said input image based on said information to produce an output image, said output image including said input image and said information; and

converting pixels of said input image into halftones, including diffusing halftone errors associated with said first type pixel blocks to neighboring pixel blocks of said first type pixel blocks on a block-by-block basis.

18. The method of claim 17 wherein said first type pixel blocks of said input image include minority pixel blocks, said minority pixel blocks being pixel blocks that include a majority of pixels that contrast with an image background.

19. The method of claim 18 wherein said minority pixel blocks include a majority of dark pixels.

20. The method of claim 18 wherein said minority pixel blocks includes a majority of light pixels.

21. The method of claim 17 wherein said step of modulating said first type pixel blocks of said input image includes replacing said first type pixel blocks of said input image with dot shape blocks such that said information is represented by said dot shape blocks.